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Journal of the Society of Arts.

FRIDAY, DECEMBER 15, 1865.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday evenings, at Eight o'clock:—

DECEMBER 20.—“On Parkesine, its Composition, Manufacture, and Uses.” By OWEN ROWLAND, Esq.

MUSICAL EDUCATION COMMITTEE.

This Committee has resumed its meetings for the present session. The first meeting took place on Tuesday last, at two o'clock. Present:—Lord Gerald Fitzgerald; Sir John Harington, Bart.; Colonel Scott, R.E.; Captain Donnelly, R.E.; E. A. Bowring, Esq., C.B.; and Henry Cole, Esq., C.B.

The Secretary was examined in reference to his visit to the Conservatoire de Musique at Brussels, and put in a written report, embodying the result of his visit. Mr. Henry Cole, C.B., was also examined.

The evidence will be printed in subsequent *Journals*.

SUBSCRIPTIONS.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed “Cutts and Co.,” and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FIFTH ORDINARY MEETING.

Wednesday, December 13th, 1865; James Caird, Esq., in the chair.

The following candidates were proposed for election as members of the Society:—

Dahrymple, Robert Farre, 46, Parliament-street, S.W.
Edwards, Rev. Joseph, Vicarage, Barrow-upon-Trent, Derby.
Galpin, Thomas Dixon, La Belle Sauvage-yard, Ludgate-hill, E.C.
Garrod, J., 56, Upper Thames-street, E.C.
Gideon, Henry H., 8, London-street, Fenchurch-st., E.C.
Harton, Samuel, jun., 61 and 62, Shoe-lane, E.C.
Shaw, Matthew T., 64, Cannon-street, E.C.
Smith, William Baxter, 37, King-street, Cheapside, E.C.
Southey, Thomas, Clapham-park, S.
Tidswell, J., 28, Budge-row, E.C.
Walker, Robert, 58, London-wall, E.C.
Watson, Charles, M.D., 1, South-crescent, Bedford-square, W.C.
White, W. W., 5, Great Winchester-street, E.C.

Wieler, William Julius, 73, Mark-lane, E.C.
Williams, William, 41, Basinghall-street, E.C.
Wontner, Thomas, 26, Bucklersbury, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Bailey, Vincent, 26, Orsett-terrace, Hyde-park, W.
Bazalgette, Joseph W., Wimbledon, S.W.
Becker, Hermann, M.D., Park Browse House, Lizard, Cornwall.
Butler, Edward R., 9, Madina-villas, Hove, Brighton.
Dowson, Alfred C., Arts Club, 17, Hanover-square, W.
Finlaison, Alexander Glen, National Debt Office, 19, Old Jewry, E.C.
Gray, William, 5, Tokenhouse-yard, E.C., and 9, The Grove, Lee, Kent, S.E.
Lambe, Frederick, 4, Villas, Erith, S.E., and 2, Cushion-court, Old Broad-street, E.C.
Latham, Baldwin, C.E., Broad-green, Croydon, S.
Mare, Charles John, 21, Great St. Helen's, E.C.
Pullman, John, jun., 17, Greek-street, Soho, W.
Talrich, Jules Victor Jacques, 42, Rue du Col de Médecine, Paris.

The Paper read was—

ON LONDON MILK.

By J. CHALMERS MORTON, Esq.

It is the object of the following paper to relate whatever information on the production and consumption of milk in London could be collected in a very limited time by a single volunteer inquirer. The subject was suggested twelve months ago as proper for discussion before this Society, which occupies itself not only with strictly agricultural questions, but also with matters connected with the health and general welfare of the population; and it has since then excited unusual interest, owing to the diminished supply of milk which has latterly been occasioned by the cattle plague. It was not, however, until a fruitless attempt had been made to enlist another inquirer, who possessed better opportunities than mine of investigating this subject, that I resolved to devote whatever time could be commanded during October and November to its examination for the purpose of this paper.

No justification will be considered necessary of an attempt of this kind to throw all the light that can be brought to bear on an important branch of our food supply—neither has any such justification been required by the great majority of those to whom my inquiries have been addressed. From wholesale and retail dealers in milk—from the railway companies who are carriers of milk—from the district medical officers of the metropolis, whose inspectors have the oversight of the cow-houses within their respective districts—from these inspectors, and from all the cow-keepers, without exception, to whom they have introduced me, I have had frank replies to all my questions; indeed it seemed in this way to be cordially admitted that the outside public, whose interest in the subject I represented, had a right to the information that was sought. It was doubtless perfectly competent for any of these authorities to have refused to me personally the insight that was desired into their respective shares in the great business of supplying London with milk, but they very kindly took my inquiries as having no personal object whatever, but as emanating from that justifiable interest of the outside public in the subject to which I have referred. Although perfectly aware that every Englishman's house is his castle, they knew that this rule does not apply to his shop. Customers have a right to enter there, and, indeed, are always welcome. They have to be satisfied, informed, propitiated; and, however able generally to take care of themselves, Government has made, and public opinion sanctions, so many interferences

on their behalf, that an inquiry conducted in their interest comes to be received with a civility and friendliness for which, in this particular instance, my best thanks are due.

It is the result of this inquiry that I have now to lay before you, and it becomes necessary in the outset to state the means of information which were open to me, and of which use was made. There was in the first place sufficient acquaintance with the experience of farmers in many of our dairy districts. I know their **management**, and personally many of themselves, in the Vale of Gloucester, in Wiltshire, Cheshire, Ayrshire; and I am thus sufficiently acquainted with the relation between cow food and dairy produce in the country. Moreover, the precise returns for many years of quantity and produce on the Frocester Court farm, Gloucestershire, have been published by Mr. Harrison; similar information has been published by Mr. MacAdam, of Crewe, and the results of prolonged investigations have been given by Dr. Voelcker. To any questions as to the quantity and quality of the milk produced under ordinary country feeding, there are thus sufficient answers. As to the quantity of milk supplied to London, the metropolitan railways have given me monthly returns of their imports—most of them for several years, all of them for several months. The clerks or inspectors of the 44 divisions in which the metropolitan district is arranged, have told me the number of their licensed cowhouses, and they and the Veterinary Department of the Privy Council have given me returns of the number of cows milked in them usually and at present. Thanks for the most part to the inspectors, to whom I was introduced by the medical officers of the several districts, I have examined cowhouses in the Hendon district, in the Islington district, in St. John's Wood, Marylebone, St. Pancras, the Strand, the City, Chelsea, Clerkenwell, in Bethnal-green, Mile-end Old Town, Belgravia, and Limehouse. I have thus seen 51 cowhouses in all, and in every case conversation with the cowkeepers, or their men has informed me as to the food given, the milk produced, and the risks and losses incurred. In one case, that of Lord Granville's large dairy, near Hendon, I have had the recorded results of several years' experience as to food and produce, expenditure, losses and returns, placed in my hands by Mr. Panter, his lordship's steward; and the corresponding figures for Colonel Talbot's equally large dairy at Sudbury have also been shown to me. There is, moreover, the corresponding experience to some extent of very large cowhouses for the supply of other towns, as for example, the large dairy on Mr. Littledale's farm at Birkenhead; the monster establishment of Mr. Harvey at Port Dundas, in Glasgow; several of the Leith and Edinburgh dairies; that of Mr. Hilder, near Woking; and of Mr. Collinson Hall, near Brentwood; from all of which particulars bearing on the subject have been gleaned. Then as to the trade in milk, I have been informed by Messrs. Marriage and Impey and Mr. Collinson Hall, wholesale dealers, who supply probably 100,000 quarts a week throughout the year; and by a very large number of retail dealers, both men who keep cows and sell their produce, and men who buy milk from the wholesale dealers to sell again; and I have had conversation with the men in charge of the railway traffic.

Lastly, as to the consumption of milk, the statistics of the milk supply to Stirling in Scotland, and Mansfield and Bedford, in England, have been procured for me as a sort of datum line for comparison, and a good deal of information has been received on the consumption of milk in country villages and families. Moreover, I have gone to institutions where the food of inmates has been under medical supervision, and where the dietary has been framed with a simple view to health, and I have to thank the officers of no fewer than 16 different hospitals, not infirmaries for the treatment of patients, but asylums, orphan-houses, schools, and workhouses, for the actual

daily consumption of milk by many thousand healthy people, including 5300 children under 10 years of age, and 3000 adults. And, on the other hand, thanks to some of the benevolent people visiting in the district, I have obtained information of the milk consumption in two or three of the lowest courts in the Strand district, where it is hard necessity which dictates the maximum, not medical advice which limits the minimum, scale of feeding. Lastly, we all have in the report of Dr. Edward Smith to Government an immense mass of information on the dietaries (including milk) of the poorer classes throughout the kingdom.

Applying such data as we thus obtain to the population of London, we learn whether it can be considered well-fed or not as regards its milk.

Here the question of quality comes in. Starting with a very strong impression that London milk is almost invariably diluted, I am bound to say that as you make your rounds among inspectors, dealers, and even its producers, you find (with many an exception where you cannot doubt the thorough honesty of the retail dealer) that this impression is equally strong in those who are most closely connected with the trade itself. Milk, incapable of being kept, and with more or less of a variable supply, must be stretched by dilution, more or less, to meet even a constant demand, and still more is a stretch of this kind required to meet an uncertain demand, varying considerably from day to day. But indeed it matters very little to the nourishment of the consumer, and not much, I will add, to the conscience of the producer, whether this dilution of the milk be produced by the direct addition of water or by feeding the cows on watery and succulent food. I saw two cow-houses in St. Pancras, one of which was in a wretched plight, the cows being extremely dirty and fed on the very poorest food—great quantities of distillery wash and of grains, with a little Covent-garden refuse greens—and the other over-full perhaps of cows, which, however, were cleanly kept and well fed on hay and mangel and grains, with a little meal. I would rather have milk from the latter of these dairies, notwithstanding that coming to it unannounced at milking time, I saw a can of beautifully clean water standing conveniently near to the tins into which the milk was being poured. It is not, however, on mere inference from the necessities of the trade that the presumption of dilution rests. Many analyses have been published in proof of it. Dr. Whitmore, of Wimpole-street, who is the medical officer of the Marylebone district, has been good enough to give me analyses which he has made, proving both the honesty and dishonesty of the instances examined. Dr. Druitt, of St. George's, Hanover-square, has given me the results of nearly 100 analyses by himself. Dr. Voelcker has made many analyses of town and country milk, and he has been good enough to make several for me, of milk collected from consumers in the low courts to which I have alluded; and Prof. G. T. Brown's microscopic examinations of milk, as published in the *Quarterly Journal of Science*, and in the *Agricultural Gazette*, also throw light on this subject.

I think, then, that on the whole, a good deal of information has been collected on the quantity and quality of milk supplied to London, and on the costs and risks and produce of its manufacture; also on the consumption of milk in London as compared with other places, and the risks which the consumers of it as well as its producers run. Of course the great gap made in our produce by the cattle plague could not fail of being noticed. Its relations to the present and the future supply of the metropolis have been to some extent discussed in the recent "Blue Book," issued by the Cattle Plague Commissioners, and will no doubt be further discussed this evening.

This, then, is the material which has been gradually collected during the past three months. All the documentary part of it lay unread until time offered for its arrangement a few days ago, but of course inspec-

tions and conversations have been all along gradually influencing and forming the opinions, which on the whole I believe them to justify. Looking at the thing itself, and if possible at my own relationship to it entirely from the outside, just as I have weekly had to do with agricultural evidence of all kinds for many past years, it must, I believe, be admitted that we have here a good witness, with sufficient previous knowledge and sufficient practice in the work of inspecting and reporting agricultural matters to materially reduce the risk of his being misled by what he saw and heard—and with sufficient interest in the subject and sufficient indifference as to the lessons it might teach to make him at once industriously gather facts and ungrudgingly accept any conclusions which they fairly indicated. Of course no one with any previous knowledge of a subject comes altogether unprejudiced to a further study of it; but I can unhesitatingly declare that, in studying this particular subject, I have not cared one jot what the truth might be, and that I had no personal end to serve during this endeavour to discover it. My prejudices were those of a countryman—that cows are healthier and better, and yield the best and wholesomest milk in fields—that London cow-houses are a nuisance to be abated, and that they ought to be all removed outside—that the best way of supplying a large town with milk is to bring it from the country—that it is more reasonable, cheaper, better, to carry 10 lb. weight of milk from a country farm to the town-consumer's door, than to carry 60 lb. or 70 lb. of green and other food from that farm to a cow-house close by the consumer, there to convert it into the 10 lb. of milk which it will produce—and, finally, that Londoners are worse fed with milk than any considerable body of men, women, and children elsewhere in the island. The whole inquiry, I am bound to say, has led me very materially to alter these impressions. I now believe that London cow-houses need not be a nuisance—not so great a nuisance certainly as London stables—I believe that the milk made in them is better than what is delivered at the railway stations from the country—that it is a wiser, cheaper, and better thing to carry mangels, grass, and hay the few miles needed to the town than to carry one-sixth their weight of the milk they yield 20 or 30 miles from the country. I believe that cows in London cow-houses are and may be healthily and comfortably kept—nowhere more so, and that the risk of loss by disease, so far as regards the manner of their food and lodging, is not greater here than in the Gloucestershire and Cheshire pastures; and I believe that hitherto, in point of fact, London has been better fed with milk than the average of south country villages.

These conclusions will startle and perhaps disgust some who may have come here expecting a wholesale condemnation of the London milk trade, with all its presumed abominations of filthy cow-houses and adulterations. I believe, them, nevertheless, to be inevitable by any one who shall give sufficient time to a fair examination of the subject. They are the conclusions simply of an agriculturist anxious that the best food should be produced and offered to the consumer. Medical men, who are professionally interested, not only in people being well fed, but in their being kept free from active sources of injury to their health, may insist upon it that animals using and spoiling so much more air than men, should not be permitted in densely-populated districts. And I can understand the outraged feeling with which the medical officer of a district, having power given him to reduce the number of human inmates of a tenement within certain limits, and exercising that power unhesitatingly for their good, finds himself, as in instances known to me he has been, thwarted, when he endeavours to secure the dismissal from a thickly populated district, of animals such as cows, which individually vitiate so much more air than is spoiled by men. But this is not my subject; all I have to do with is how to secure the best supply of milk to a densely-populated district,

Dismissing, therefore, this aspect of the question, (though I can see that it will be strongly, perhaps indignantly insisted upon in the subsequent discussion), I will state once for all, that while the facts are in favour of the milk being made near the consumer, and while there are a sufficient number of well-managed cow-houses in the town to prove that a cow-house need not be so great a nuisance as a stable to the dwelling-house next door, yet the conditions of the best arrangement are no doubt best observed when cow-houses are situated in the immediate outskirts of a town, not within its boundaries. It may, however, be usefully remembered, as regards the metropolis, that a cow-house, one-storied, with an animal to every 40 or 50 feet of surface, and giving, as it almost always does, upon a yard, will not, advantageously to human health, be replaced, as it legally may, and probably will be, with a building covering both ground-plan and yard, with dwelling-houses four or five stories high, and perhaps whole families in each.

I proceed now, therefore, to the facts of the case, and, leaving a great deal of tabular matter to be read in the *Journal*, I hope the story may be told without boring you much with figures.

COUNTRY PRODUCE.

Of *Country Produce* I have not very much to say. The herd, averaging 65 cows (fair country Shorthorns), at Frocester Court Farm, Gloucestershire—fed on grass and hay, with roots and straw in winter—produced, according to Mr. Harrison's careful records, 245,458 gallons of milk in seven years, or 535 gallons each cow per annum. Mr. McAdam, of Gorsty Hill, near Crewe, who has long been known as an experienced dairyman, tells me that during the past four years 64 cows (Ayrshires) on his farm have averaged 530 gallons each. Taking the Gloucestershire experience as our guide:—For every 100 acres (22 being arable, as ascertained by Mr. Harrison in the case of 23 farms) in a district where the average crop of meadow hay is probably 28 cwt. per acre, the stock kept is about 20 cows, four 2-year olds, four yearlings, four calves, 20 sheep, and three horses, equal in consuming power to about 32 cows. The hay crop represents perhaps rather less than 7 tons of grass, and the aftermath (at $\frac{2}{3}$ the first cut) is probably less than 3 tons per acre. The whole cattle food of the 100 acres, half the arable land being taken as in turnips and clover, may thus be put at 900 tons of grass, or 28 tons of green food per cow per annum, equal to 170 lb. of grass a day to each. This, however, is where the grass is depastured—that is fed in the most wasteful way; and it is probable that if the calculation had had to deal with the case of house-fed cows, it would appear that 150 lbs. of green food daily, of the quality of ordinary meadow grass, or its equivalent, would suffice for ordinary Gloucestershire dairy cows. Putting, however, 530 gallons of milk against 28 tons of this green food, we have 1 lb. of milk to every 11 or 12 lb. of grass, or as nearly as possible 100 gallons of milk to every ton of hay. If the consuming value of hay (*i.e.* the price at which it can be grown at a fair profit to be consumed upon the land) be 60s. or 70s. a ton, then the milk can be produced in Gloucestershire to be sold at 7d. to 8½d., or say 7½d. per gallon. And to this the dairy statistics of other countries pretty nearly correspond. The figures from a farm near Christiania, published in the *Agricultural Gazette* (p. 102, 1863), show that in 1863 and 1864, taking the average of the two years, 41 cows yielded 27,000 gallons in the year, or 630 gallons each, consuming during that time, in all, 222 tons of calculated hay value, *viz.*, in grass during 120 days of summer, and turnips, hay, and chaff, with a little oilcake during the other 245 days of the year. This is at the rate of 100 gallons for every 17 cwt. of hay, or about 6½d. per gallon for food alone. But the cows (Ayrshire and country cows) were at least 100 gallons above the average in their annual produce.

Sixpence-halfpenny or $7\frac{1}{2}$ d. per gallon, however does not cover the risk of loss by disease and death.

Mr. Palin, of Stapleford, near Tarvin, Cheshire, tells me that his loss during 20 years over a stock of 50 cows was about 5 per cent. in general, 60 per cent. during two years of the time, and 15s. a cow for loss of milk on four separate occasions. Putting all this together, his loss has been £86 a-year over the 20 years in question, or nearly 12 per cent. on the value of his stock.

Mr. McAdam tells me that, out of 1,500 cows which he has had through his hands in country dairies during the past 15 years, 19 have died and 35 have been sold at a loss of £9 each, from pleuro-pneumonia; two have died from foot-and-mouth disease; and 21 have died from other causes. The foot-and-mouth disease, moreover, attacked 200 cows in this time (killing in one per cent. of the cases), and resulting, probably, in a loss of 10,000 gallons of milk. The whole loss must have exceeded £1,300 or £1,400 in the 15 years, much less per cent. than the other quoted case. And to the cost of food, $7\frac{1}{2}$ d. per gallon, there must therefore be added from $\frac{1}{2}$ d. to $\frac{3}{4}$ d. per gallon, for that is what the loss comes to over 1,500 times 530 gallons, making the cost of milk, to those who make it from grass and from hay at about £3 per ton, at least 8d. per gallon. If cows are sold after seven or eight months' milking, it will be at the cost, on such feeding, of probably £5 or £6 ahead to replace them with others just calved, while the consumption of food would probably be rather larger per annum. The produce, in place of being 530 gallons, would be, at least, 730; and the 200 extra gallons being obtained at the cost of this £5, or at 6d. a gallon, the whole produce of the year might not cost more than 7d. a gallon; but the risk from infectious diseases would be very greatly increased—more than doubled or tripled by the constant change of stock; so that in all probability milk would not be obtained much more cheaply thus than under ordinary country management, where cows are kept for five or six years upon an average, and fed in the summer time in pastures, and in winter time on hay and straw and roots, with access to both field and shed. Of course, when the object is to produce milk for London, as on many country farms a long way from town is now the case, they find cheaper, and, for their purpose, better food than hay, and they will adopt more economical management than grazing dairy cows in growing grass. And though I hear that in the Aylesbury district, hay and grass and roots and grazing in the field up till November are still the rule, yet no doubt ultimately brewers' grains and cut grass, and succulent food of all kinds given in sheds, will become the rule outside the town just as they are the rule within. Human nature is a pretty constant quantity, whether it be town or country bred; and countrymen who engage in contracts for the supply of milk to London dealers very soon find out the cheapest way of producing it in the largest quantity.

That way has long been studied and worked out with all the earnestness which self-interest inspires. You will meet in London with men who have been engaged in the business for 30 and 40 years, with a staff of servants, too, who have been in their employ almost as long. When the St. Pancras committee went round to inspect the cow-houses of the parish, and to condemn especially all of them which were in any way connected with dwelling-houses, they were met at the door of one to whom they announced the decision against him with an introduction to his grandfather and his father, then living with him, both of whom had carried on the business there before him. "And here, too, are my children, gentlemen—four generations of us. It does not look as if the cows had been injurious to health, although so near us." Of course where a business has been carried on for such a long series of years, and men come to it in this way with inherited ability, as you may say, and there has been a long experience of all kinds, both prosperous and adverse—they cannot have much

to learn of the best way to supply the demand for milk, even though the production of it be carried on under the great difficulty, as one would think it, of their long distance from green fields. But indeed this is no difficulty at all. Even in the midst of green fields the cow-keeper finds it the best policy for the production of good, abundant, and wholesome milk to keep the cows in houses; and in London, where the supply of brewers' grains is so abundant, it being the constant food all the year round wherever milk is produced for direct consumption, where large markets for mangels and for hay exist, and where grass can be supplied in abundance during summer at the cow-house for 20s. to 25s. a ton, the means of keeping cows are especially good. Here, too, we have that guarantee of the quality of milk which is afforded by a high premium on keeping cows in good condition; there is here the best market in the world for cattle of all kinds, if they are fit for the butcher, and probably as poor a market as there is anywhere for poor dry cows; moreover the risk of infectious disorders—necessarily greatest in the crowded cow-house, makes it especially necessary for the town cowkeeper to keep his stock in fattening condition, that they may be disposable at a minute's notice. And all these circumstances secure the best feeding being adopted here—much better feeding than satisfies the ordinary country dairyman. I have no doubt, therefore, that the milk yielded by a London cow is better than that which the same cow would produce under ordinary Gloucestershire or Cheshire management.

LONDON COW-HOUSES.

What, then, is a London cow-house? and what the nature of the manufacture—as we may fairly call it—which is carried on in it?

A London cow-house may be, and often is, a piece of ill-conditioned, rather rickety old stabling, with a sort of brick-built manger on the floor, the length divided by short and scanty stall divisions, 7 feet or $7\frac{1}{2}$ feet apart, furnished with ropes or straps or chains, with running rings, so as to tie up two cows between each pair. This floor is roughly causewayed, and there is a gutter lengthwise down it, parallel with the manger, and a little more than a cow's length from it. The house may be only wide enough for a single row of cows, or there may be one on either side, with the gutter between them for the drainage of both. I am now referring to the average style of the smaller and inferior cow-houses in the city, and in the poorer districts of the metropolis. You come upon one from some street of third-rate houses through an archway, perhaps under a dwelling-house, which leads you into a small back yard, half filled with this poor shedding. There may be a small pit for the dung, a store of some sort for the grains; and the small quantity of hay and roots which are kept on hand are stowed away in any convenient corner—at present there is room enough—for a full cow-house, even of this small class, in London now is a very rare exception. The roof is either low, with plenty of ventilation through its loosely-lying tiles, or if higher, there is a "tallet" or floor overhead where hay and other food is placed, and in which wide spaces are left next the walls and over the heads of the cattle, and then the space of this upper room is measured into the 1,000 cubic feet per cow, which is the rule that must be observed (for instance, in St. Pancras) if the cowkeeper wishes to avoid being opposed for a renewal of his licence. There are window places, which at this season of the year are closed, perhaps with a bit of sacking nailed over them.

This, then, is the ordinary style of a small cow-house—such as the majority of them are. You find in them six or eight or ten capital short-horn cows, or perhaps here and there occasionally along with them a few black and white Dutch cattle. It is either a clean and tidy place, where both the cowmen and their stock are clean and dry and comfortable, everything in its place, the animals all lying down, having comfortably fed, and the air with no other perceptible smell than that of the chloride which

the careful owner sprinkles once or twice a day along the gutter—or, it is a filthy hole. In some cases (generally in Bethnal-green) the dung pit is boarded over with a loose slab, to be replaced after every fresh addition to its contents, and the yard is clean and orderly and sweet. In others you will find the dirty straw, originally purchased after use in a neighbouring stable, spread abroad to dry and clean itself over poles and hurdles for repeated use as litter. In some, fresh grains, good mangels, and the best hay, with oilcake and peasmeal—the very best of cow-food—are kept tidily, and served out regularly and neatly, and the whole management is punctual, clean, and systematic. In others you will find a bin of sour distillery wash, and a heap of stinking turnip-tops and cabbage refuse, and the whole place dirty and offensive. In general the accommodation—limited as it is—is quite apart from the dwelling-house, but there are exceptions even to this. There is a cow-house in the St. Pancras district, otherwise well kept, which is the lower apartment—cellar it may be called—of a dwelling-house, though it opens on a yard descending to it from the street; it is 16 feet square and 7 feet high, barely 1,800 cubic feet in all, and now holds 2 cows—formerly it held 11—its licence is not to be renewed. There is another in the Strand district not so cleanly kept, where the shop or dairy is approached through the removal, as it were, of the ground-floor front room, which is thus laid open to the street, and as you walk through it you look down the central opening upon a cow-house of considerable size in the cellarage, where there is accommodation for a dozen or more—only three being there at present. Such then is the smaller but most numerous sort of London cow-house.

Go a step higher, and you come upon a class of men, many of them also occupying small farms near town, all of them employing very considerable capital, which has, however, largely disappeared during the past autumn, under the ravages of the plague. They keep 30, 50, 80, or more cows apiece, and these are lodged either in larger establishments of the kind already described—not unfrequently ram-shackle old buildings with yards attached, either with double-roofed cow-houses, or covering a square, sometimes with a floor overhead, and at others, open to the roof, where the cows are arranged, first around the walls, and then in a square block head to head in the middle.

Sometimes there are parallel rows of roofing together covering a square, and double rows of stalls under each. And here, too, there is the same variety of management as to cleanliness and order. I could point out some samples even of this higher class, which are unquestionable nuisances, and others as clean and sweet as a parlour; for in this middle class of cowhouses, as they may be called, there are examples of the very best style of cow accommodation.

In Chelsea, there are many examples where cows, as good for milk as any in England, are as comfortably housed as you shall find them anywhere—in sheds open to a clean and airy yard during summer, but provided with hanging flaps and doors for winter time. For example, you may enter through a wide gateway a passage roofed with glass, covered with vine-leaf, and sometimes grapes, leading you to a well-kept yard, with clean and comfortable cow-shed on one side, and stabling, hay-house, and food-store on the other, and an inner cow-house further on. Both shed and house are filled with first-rate large-framed, fleshy Shorthorn cows—fed on grains and hay, and mangels, meal, and cake in winter, and vetches or grass, and grain and meal in summer time, and the master, in the highly-polished shop and dairy on the premises, hands you testimonials from half the titled families in the west to the quality of his milk. Or you may enter a larger yard in a poorer neighbourhood, and find shedding closed against the winter, providing as good accommodation, in single rows, for as good a herd of dairy cows as I ever saw—cleanliness and order being apparent everywhere. Or you may

pass from a well-kept mews into a lofty, clean, and, though ceiled, well-ventilated and well-drained apartment, at least 12 feet high, with, I should suppose, 60 square feet of standing ground to every beast—warm, well-watered, and well-fed. Where could cows be more comfortably kept? In every instance I am describing actual examples.

In Marylebone you find, in a good street, a corner shop, where the side road leads to a well-kept first-class mews. The master takes you through his three-storied cow-house, as you may call it—and first into an apartment for 12 or 16 cows, which is the quarantine station through which after some weeks' trial they pass into the other rooms, one directly over head, reached by a sloping gangway, and the other along-side, but lower down. The floors are all closely bricked in cement, the upper one being laid on brick arches, and the drainage is everywhere perfect. I may refer personally to Mr. Drewell's establishment at No. 6, Upper Weymouth-street, for the example of intelligence and pluck with which great losses have been met by him, and further losses have been resisted. He has taken special precautions against infection, and shown extreme care in destroying it whenever it appeared. The whole of the brick flooring has been taken up, disinfected and relaid. The plan of turning the noses of the cattle, so as to disinfect the very air they breathe, was adopted, but ultimately abandoned for the neater plan of nailing on the wall before them a wide strip of absorbent deal well soaked in creosote. Iron having been pronounced a remedy or preventive, the well upon the premises was thoroughly chalybeated by throwing in old iron, and every possible device was used to insure the perfect sweetness of floor and food and air. I can assure this meeting, containing no doubt many countrymen, that they will nowhere find better, cleaner, neater, and sweeter cow-houses than, taking these examples as an illustration, may be kept and are to be found in London streets.

Lastly, I come to the larger establishments; and Mr. Drewell, holding a couple of large cow-houses, and originally milking 140 to 150 cows, of which, however, he has since lost 100 by the plague, might have been referred to under this division. I refer, however, now to the largest houses, where 200 cows and upwards have been generally milked. And here, too, you find two classes of establishments—houses, on the one hand, where you can touch the ceiling, dark and dirty, and crowded with unfortunate beasts; or where, in spite of ample space and lofty roof, the poor cows are comfortless and filthy—and places, on the other hand, where the accommodation is first-rate, roomy, clean, and comfortable—a single cattle shed, it may be, like Mr. Camp's, in St. Pancras, in the midst of a large and roomy yard, 90 yards long and 26 feet wide, with a broad gangway between two rows of cattle—or several sheds, clean, dry and warm, each well managed, placed at intervals in a clean and spacious yard, such as Mr. Veale's first-rate establishment, in the Acadia-road, St. John's-wood.

Such then are the London cowhouses, of many sizes, and of at least two styles of management, in one of which a daily cleansing of the whole establishment, dung pits included, insures perfect order and condition, and in the other muddle and dirt easily create a nuisance.

Let me here state it as a mere matter of fact, that the fatality and even the advent of the cattle plague has had no sort of connection or relationship with the condition of the cow-houses where it appeared or where it did not appear. Anyone going round the London cow-houses to study the cattle plague in them, is thus forced to the conviction that it is the result of some new and special poison which has been introduced. The largest, cleanest, best managed cow-houses have been swept out, and the filthiest holes have in many instances escaped. In Bethnal-green you come repeatedly on small cowkeepers who have lost their all, while close by are others who have not suffered, and there has been no difference whatever in their management. Mrs. Nicholls's cow-house (Laycock's dairy), Islington, where the disease

first appeared, a large and roomy, clean, and well-kept place, lost all its cows, and a second lot bought in immediately were also carried off. In Mr. Camp's capital house the disease appeared in a couple of instances, and the whole stock was immediately sent to market. Only the other day, on applying at the Vestry of Mile End Old Town, for an introduction, through the inspectors, to the cow-houses there, I was told, "One of our largest men, Mr. Alexander, is so particular that he won't let you come in if you have been to any other cow-house in the district." I called on Mr. Alexander, and found that the disease had appeared or threatened in a case or two in his well-kept establishment, and he had immediately sent the whole of his stock to market. One cow-keeper in St. Pancras—a capital fellow I know he is, for the hearty way in which he stands under the heavy losses he has suffered, had two cow-houses, one lofty, large, and roomy, the other offering very dilapidated, low, and poor accommodation. The cattle in the good house died, and the plague has never entered the other. One of the dirtiest cow-houses I know in London, where cabbage refuse, stinking wash, and dirty stable-dung for litter, combined to make as filthy a hole as ever cows were kept in, not far off this place, had not then been visited. Where indeed will you find a better illustration of the same kind than is afforded by Lord Granville's well-kept, lofty, roomy cow-house at Golder's-green, in the midst of green fields. It was as bad a case as any of losses by the plague, and his 100 cows, among the best kept in London, were among the first to suffer.

I may here add that as a general rule the London cowkeepers have shown great energy and resolution in combating their new and dreadful enemy. You smell chlorine in the cowhouses almost everywhere, and the interiors are generally fresh lime-washed at intervals. Where the disease has occurred, the flooring has been grubbed up and disinfected with both chloride of lime and caustic lime, the whole place has been scrubbed and lime-washed, and sufficient time has generally been allowed to pass before fresh cows were brought in.

THE MILK PRODUCE.

Such being the cowhouse, what is the manufacture carried on in it?—In order to the profitable conversion of cow-food into milk, you must make use of the best animals in the right constitutional condition, you must feed them well, and you must keep them warm. Fresh-calved short-horn cows or animals of the black and white Dutch (a good dairy) breed, are therefore selected. They are fed on grains, hay and roots in winter, and grains and grass in summer, and watered regularly. In many dairies meal or bran is also always given daily to the cows, and in some it is given very liberally, but when in heavy milk they almost always get a quart of pea or barleymeal, or half a peck of bran thrown in with their grains, morning and evening, and when shrinking their milk after being six or seven or eight months at the pail (and there are examples spoken of and sometimes seen in almost all large dairies where cows milk on without breeding for one and two and even a third year) they receive cake and meal to get them fat as rapidly as possible. They are sold, you may say invariably, to the butcher, at such time as, considering the demand for milk (for to the last they are giving some), or the state of the market, is most convenient to the owner; and freshly calved cows are bought in their place. The average time a cow remains on hand varies exceedingly. In order to keep 100 stalls full of milking cows, 100, 120, 150, 170, and even 200 are annually bought, making in the several instances the average length of time during which a cow is kept in milk, 12, 11, 9, 7, 6 months respectively; and rarely are they calved down and kept on a second year. The loss upon the exchange varies very much, from £2 or £3 to £4 and even £5 a head, and that corresponds of course to much more per stall, *i.e.* per cow actually in milk, because there may be 150 of these exchanges in the year for

every 100 cow stalls. It matters nothing whether you take your examples of management from the country or from the town, for the management and experience are alike in both. I give therefore the following figures from Lord Granville's dairy farm at Hendon, and from Colonel the Hon. W. P. Talbot's farm at Sudbury. The former had a good deal of loss from foot-and-mouth disease and pleuro-pneumonia during the last two or three years, and the latter has been in perfect prosperity; the former represents average management as to feeding—the latter represents the highest feeding, and thus the average of the two may fairly represent the average of the town dairymen.

Mr. Panter, his lordship's steward, tells me that they milk from 90 to 130 cows, averaging 100, 108, and 120 cows respectively in the years ending Midsummer, 1863, 1864, and 1865 respectively. Taking the middle year of these, to keep 108 cows in milk they sold 161 for £2,317, or £14 14s. each, and bought 163 for £18 18s. each, losing £4 4s. apiece by the transaction, but more than £6 per stall or cow kept milking. The milk sold during that year fetched £4,300, which, at the price it realised, *i.e.* 1s. 10d. per barn gallon, corresponds to 93,818 imperial gallons, or 868 gallons per cow in constant milk, *i.e.*, per stall; and this is 9½ quarts a day upon an average. They received daily 1½ bushels of grain apiece, 15 lbs. of hay, and 30 lbs. of mangels during winter; and in summer the grains with grass, *viz.*, $\frac{2}{3}$ of an acre of a crop equal to 30 cwt. of hay as the daily ration of 120 cows, which may thus be said to have eaten rather more than 1 cwt. apiece. Besides all this, 4 lbs. daily of pea or other meal were given with the grains as the cows began to fail in milk; so that when they fell to perhaps 5 quarts of milk a day they were fat enough to go to the butcher. In three years, the stock being 100, 108, and 120 cows respectively, the return was £3,900 to £4,300, equal in all to about £40 per stall under this feeding; from which has to be deducted a yearly loss of £6 or £7 per stall to keep the stock of constant value.

During these years, however, the herd suffered frequently from foot-and-mouth disease, and occasionally from pleuro, so that forced sales and diminished yield were frequent, and thus the loss of £4 4s. per head, or nearly £7 per stall, is no doubt very much larger than it is in the average of town dairies. In Colonel Talbot's dairy at Sudbury, where the feeding is higher and there had been no disease, they milked about 80 cows, and sold 153 in the course of last year; purchased for £19 10s. apiece, and sold for £18 10s. apiece upon an average, so that there has been a loss of about £1 per head or £2 per stall; and the returns here are £4,090, which at 1s. 10d. per barn gallon represents 89,236 imperial gallons, or nearly 1,100 gallons per cow in milk, which is close on 3 gallons per stall a day. Here the feeding included meal of various kinds, 3 or 4 lbs. a head daily throughout the year, and the cows, bought at an average of £19 10s., are of first-rate quality.

I have here a table, giving the daily rations of a cow, and in some cases the actual, but generally the *estimated* daily return of milk in 14 of the instances examined by me, a dozen of which are strictly town dairies. The letter F, opposite the entries of meal or food, indicates that in these cases it was given only to fattening cows, in others it was given continually. It will be seen that the grains given vary from $\frac{1}{3}$ of a bushel daily to as much as nearly 2 bushels a day; the hay from 6 lbs. to 15 lbs.; the roots from 25 lbs. to 60 lbs.; and cake or meal from nothing up to 5 lbs. apiece, given regularly, or to from 3 to 5 lbs. given only to fating stock. And the daily produce per stall, *i.e.*, per cow in milk, is estimated at from 9 to 12 quarts daily, a difference not greater than has actually existed between Lord Granville and Colonel Talbot during the past few years. Distillery wash is only mentioned once in this table; it is, however, given in many dairies of all sizes at from 4 to 10 or 12 gallons daily—generally mixed up in a mess with grains and hay chaff, and sometimes meal.

No.	Cows milked.	Cows bought per annum.	Loss on sales per stall.	Daily winter rations of a cow.						Daily produce of milk per stall.
				Grains.	Hay.	Distillery Wash.	Roots.	Meal or cake.		
	No.	No.		bsh.	lb.	gal.	lb.	lb.	qts.	
1	108	160	£7	1½	15	...	30	3 (F)	9½	
2	80	150	2	1½	...	...	?	4	12	
3	40	40	?	1	14	...	40	2 (F)	10	
4	68	76	?	?	?	...	42	?	9½	
5	10	?	?	1½	12	...	60	2 (F)	?	
6	100	150	?	1½	9	...	56	3	?	
7	20	?	?	1	6	...	56	3	?	
8	?	?	?	1	14	...	28	{ pint condiment }	12	
9	50	100	?	1	12	...	28	peck bran.	12	
10	?	?	?	1½	9	...	28	pint meal	9½	
11	?	?	?	1½	15	...	30	?	13	
12	50	75	?	1	14	...	25	5	10	
13	?	?	?	1½	7	...	60	4	9	
14	?	?	?	1½	11	6	42	3	10	

The summer ration is grass as much as they will eat, grains, and a little meal.

I must now compare food and produce here, as I did in the case of country milk. Putting hay at £5 a ton, grains at 3d. a bushel, meal at a 1d. per lb., and roots at 20s. a ton—the mere food of a town-fed cow may be said to average 9s. or 10s. a week, it is often as much as 12s., and the milk from this food, at 2s. a barn gallon, is worth 17s. 6d. a week; out of the difference the cow-keeper has to pay for rent and labour, and for the cost, under natural deterioration and occasional disease, of keeping the stock good. There are no actual records attainable on a sufficient scale of time and number to be trustworthy, but I believe that the disposal of at least one in every ten of the cows that are bought is a forced sale. This is mainly owing to the occasional sweeping attacks of pleuro-pneumonia which are suffered. The first symptoms of its approach are always carefully watched for, and the animal is at once sold to the butcher at whatever sacrifice. The loss per stall is, in the case of many a cow, nothing whatever from these changes—under good feeding the stock is often kept at stock value for milking purposes without loss—but taking forced and hurried sales into account, the loss can hardly be considered less in general than £5 a year per stall, or 2s. per week. For 12s. a week these animals may be kept to yield 17 or 18 gallons of milk, which is at the cost of about 9d an imperial gallon. I cannot tell you in detail what the expense of rent and labour on the average of London dairies is. These items, and fair profit too, were considered in the assumed price of hay upon the country farm; but, adding rent and labour, and fair profit to the cost of keeping stock in food and health in towns, the wholesale price of 1s. an imperial gallon does not much exceed the total cost of it. The expense of labour must be very considerable, and the life generally is a hard one, both of the labouring men and of the master, who generally shares it and always superintends it. Let me describe a day's experience of it. You rise at 4, clean out the house, and milk the cows, taking probably 12 to your own share. The milk is taken from you to the dairy, and there placed in the cans in which it is carried round to customers. You then feed the cows with half a bushel of grains or more to each, with perhaps a quart of meal in it, or half a peck of bran, or it may be no addition at all. I have met with the use of spiced meal or condiment in two or three cases, at the rate of half a pint to each. You give them a bit of hay apiece, and you then sweep up the house and, if it is a small business, you go to undertake the labour, or at least a share of it, of carrying round the milk and crying it along the streets. At eight o'clock you breakfast, and at nine the cows are watered, and perhaps 12lb. of mangels and another lot of hay, 2lbs. or 3lbs. a-piece, are served round, and then they are swept out, and left till milking time again. This is at one o'clock, when the place is again cleaned and the

gutters swilled out, the cows being milked and fed on grains and hay as before, and you then go round with the milk again, come in and give them roots and hay and water, and litter them, and leave them for the night. Or, take the example of a farm 20 miles from London; I quote the letter of a correspondent:—

"We begin milking at one o'clock in the morning; each man should have fifteen cows. The milk arrives at five o'clock in London. The cows are again milked at ten o'clock, and the milk is in London at one o'clock.

"They are fed as follows:—each man gives about 4 lbs. of meadow hay to his fifteen cows, and then goes to bed. At seven o'clock he mixes $\frac{1}{2}$ bushel of grains with a bushel of sweet chaff, and a handful of salt; the cows are then cleaned and fresh littered; 2 lbs. of hay given, and at eleven o'clock 1 lb. of mangel is given; and at four o'clock p.m., 1 bushel of grains and chaff; and at six about 2 lbs. or 3 lbs. of hay. The cows are not untied, that they may not mix together, and their water is carried to them. I have never seen them more healthy than at present, or giving more milk. We feed often, and not large quantities at once.

"Lime on the floors, and gas tar enough to be not offensive, and ten drops of arsenicum (3rd dilution) in their water; great cleanliness, and all their provender good; not putting too many in one shed; good ventilation at the top; no draughts. These are my precautions.

"The London milk usually sold," (he says, and he ought to know) "is about one-third water, but there are some that make up a compound, one-third being milk. I am informed the French police inspect the milk vended in Paris. Could not this be enforced for London?"

So much for mere labour—and how much for trouble and anxiety of mind, for the cowkeeper has to deal with one of the most excitable and sensitive of animals, and his mode of keeping her on the richest succulent food, and, if possible, in constant summer warmth—for the warmth of the cow-house is a point of great importance to its productiveness of milk—goes no doubt to increase this actual sensibility to the utmost. Moreover, he has to deal with one of the most easily spoiled and sensitive of commodities. Everything may be said to be in the condition of ticklish equilibrium—a breath of infection may sweep the cattle stalls to ruin, or at any rate to almost ruinous loss; a passing thunder storm or blast of hot air may spoil the contents of the dairy. I say that if milk is delivered to the purchaser as the cow delivers it to the pail, the cow-keeper wins his profit out of mere labour and anxiety than almost any other manufacturer or tradesman. And unquestionably the milk very often is delivered genuine, for the milk dealers who give 2s. a barn gallon (less formerly, but more at present) often come and milk the cows themselves.

QUALITY OF THE MILK.

Now therefore for the question of quality. It cannot be doubted that with the feeding which it is the interest of the cowkeeper to adopt in town, the quality of the milk must be first-rate, and analysis has often proved it so.

I have here an analysis of a sample, not taken from the cow, but I am thankful to be able to say, for it is very good, impounded fourteen days ago at a poor door in a poor court in the Strand district. It contained 12 per cent. of cream and 3.84 of pure fatty matter, and was undoubtedly a genuine and first-rate milk. This single fact will prove that not merely the dealer who buys it from the cowkeeper—not merely the retail shopman who buys it from the dealer—but the poor consumer who buys it from the servant of the last-named man, and on whom therefore the risk of an accumulated dishonesty falls—do sometimes get milk pure. I must, however, frankly confess my belief that this is a very rare exception to the general rule.

The following table gives examples of nine analyses which Dr. Voelcker has been good enough to make for me

for the purpose of this report, all of different samples, from different courts and poor quarters in the Strand district. All except No. 5 were exceedingly, many of them shamefully, adulterated.

COMPOSITION OF FIVE SAMPLES OF MILK.—STRAND DISTRICT.

	1	2	3	4	5
Water	93.75	93.04	90.98	93.32	88.38
Pure fatty matters	1.72	2.25	2.58	1.69	3.84
*Caseine (curd and a little albumen	1.75	1.75	2.50	1.69	3.18
Milk sugar	2.13	2.57	3.41	2.64	3.90
Mineral matter (ash)	.65	.39	.53	.66	.70
	100.00	100.00	100.00	100.00	100.00
*Containing nitrogen	.28	.28	.40	.27	.51
Per-centage of cream by volume	4	6½	6	4½	12
Specific gravity of milk at 62°	1.019	1.017	1.021	1.020	1.030
Specific gravity of skimmed milk at 62° F	1.020	1.019	1.023	{ Not determined.	

PARTIAL ANALYSES AND DETERMINATIONS IN SOME SAMPLES OF LONDON MILK.—STRAND DISTRICT.

	6	7	8	9
Specific gravity of milk	1.018	1.022	1.021	1.021
Percentage of cream by volume	5½	7	6	5

SAMPLES FROM KENSINGTON AND CAMDEN-TOWN.

	Kensington.				Camden Town.
	10	11	12	13	14
Specific gravity	1.029	1.029	1.025	1.023	1.019
Percentage of cream	8½	Not yet made.			5
Percentage of water	...	...			93.26

It will be seen by the reader of this table that, in eight cases out of nine in the Strand district, the milk was diluted up to 40 or 50 per cent. with water. In Kensington and Camden-town a somewhat smaller proportion was found to be adulterated.—In a late report to the Marylebone vestry, Dr. Whitmore, the medical officer of that district, refers to the general results of analyses by himself, from which you gather that out of 20 samples indiscriminately purchased, there were only eight adulterated, and of the others some were particularly rich, containing 10, 11, and even 14 per cent. of cream. Dr. Druitt, in one of his quarterly publications, as medical officer for St. George's, Hanover-square, speaks of 82 analyses made in the autumn months of 1861, of samples purchased indiscriminately from 46 dealers all over that parish, and of these 22 proved to be "reasonably good;" 24, though probably genuine, were poor; 23 were of extremely low specific gravity from the addition of water, and three were in such a condition (it is supposed from artificial treatment), that they would not coagulate with rennet, and were probably therefore unfit for children. As to the specific gravity test, Dr. Whitmore alleges its inadequacy, owing to the fact that water as well as cream is lighter than milk—so that a low specific gravity may be due to the excess of either one or other of these very different ingredients—but Dr. Voelcker informs me that cream, though lighter than milk, is heavier than water, and therefore, excepting the case when water has been added in well-devised proportions to *skim milk*! (and when, therefore, the adulteration must be obvious at once) the specific gravity test may be depended on.

There are, I believe, cowkeepers in this room who know, from their own conscientious management of their business, that genuine milk is to be had in London shops—and, remember, I have not been speaking of the impossibility of individual consumers, with a personal knowledge of those with whom they deal, getting good milk—it is of the supply on the whole

of the millions of the metropolis that I have been speaking—and I believe that cowkeepers will universally admit that, generally, it is watered. The popular prejudice on this point is no doubt correct. As to the other popular prejudices, however, connected with the subject—the idea, for instance, that chalk is added, the outrageous idea that "brains," as we have heard, and other filthy animal jellies are added, they may be dismissed as utter fiction. I have never met with a chemist who has detected chalk in milk; and to anyone who knows how difficult it is even in country houses to keep good milk sweet for any length of time, the idea of any other addition than pure water is absurd. I am not here to defend nor yet to condemn the London milk trade, but simply to tell the truth about it, regardless whom it may affect, and I have no doubt the truth is, that the milk (probably in the majority of cases) which we drink in London is diluted, nor can there be the slightest hesitation in declaring that this dilution, supposing it to be practised and denied, is dishonesty morally equivalent to theft; so also is the sale, as new, of milk that has been skimmed. Well, gentlemen, how are you going to avoid being cheated in this way? Are you going to depend on milk brought in from the country, or, perhaps, on the large and wholesale management of monster cowhouses by great companies, under the guarantee of gentlemen of unimpeachable honour, and under the skilful direction of distinguished veterinary authority. I believe the standard of morality to be pretty uniform—not higher even in the fields and lanes and cottages of country life than in the shops and streets of cities; and the dealer—I mean, of course, the honest dealer—who fills his cans amidst green fields, will have no better chance (though a very good one no doubt he will have) of supplying you with undiluted milk than the man who takes his milk from London cowhouses. In every case, too, whether that of a company or of a town or country dealer, you are dependent (often, no doubt, safely dependent) on the honesty of the servant who distributes it. But Dr. Whitmore tells me that his analyses have proved that milk purchased casually in the shop, and milk delivered by the carrier at the door of the consumer from the very same shop, are often very different things. A dishonest carrier has the chance, if he chooses, of supplying milk to a dishonest retail dealer, and filling up his can with water. Adulteration can only be prevented by the establishment of analytic supervision—a scientific agency constantly employed in comparing the composition of the milk offered in the shops with that of the milk drawn from the cow. An agency of the kind would, doubtless, be a very efficient and useful department of police, and there seems no reason why quality should not be tested constantly in this way by comparison with the genuine article, seeing that quantity is being constantly determined by the official comparison of weights and measures with the proper standards.

Suppose, however, that absolute honesty were (as I believe the per centage of honesty on the great scale to be) a pretty constant quantity and generally prevalent; how then about country milk as compared with that of the London cowhouse? Why, even then I believe the latter is likely to be the better of the two. First, it is more the interest of the cowkeeper here to feed his stock well than it would be the interest of the cowkeeper there; the latter has conveniences for calving his cows and keeping them on; the former must sell his cows as they get dry to the butcher. Secondly, milk brought 50 or 60 miles, as very much now is, to London, must be at least 12 hours old before it reaches the consumer; that from the London cowhouse is about four hours old, or barely so much. Thirdly, the shaking of the milk along the course of 50 or 60 miles of railway and the rattling over the roads to and from the station is certain in a proportion of instances to injure the milk, in other cases utterly to spoil it—in all, I may say, so far to injure it that it will not keep so long nor be so useful for certain purposes. That is the presumptive case against the country

milk as compared with that produced in London. What is the fact? If you want to know the real value of one or the other you must find out, not what the consumers of it give, but what dealers in it can afford to give who supply the shops—that unquestionably is the true measure of its value. Dealers in milk will give from 4d. to 6d. per barn gallon more for town-shed milk than for what is delivered by the railways. And no wonder, for even now it often comes in sour, and what must it be in the hot weather of summer? It is with very great regret indeed that the retail dealer finds himself cut off from his supply of town-shed milk, and forced to betake himself to the dealer from the country. London milk in London is worth more by a $\frac{1}{2}$ d. to $\frac{3}{4}$ d. a quart than country milk in London. And that is a difference which would of itself be quite enough to account for the fact that bulky grass and mangels are carried many miles to London cow-houses, there to be consumed instead of being consumed by cows at home, even though there were not the great advantages which the London cow-keeper has in the close neighbourhood of the great breweries with their enormous supplies of grains.

But whatever the superiority of the town-shed milk, it is plain from the way in which the cowhouses have been emptied by the plague, that London will hereafter be fed from the country more generally than it has been. What is the quantity which has been hitherto consumed in town? I have here the published returns from the metropolitan association of medical officers of health of the number of cowsheds and of cows, so far as could be

ascertained by inspection and inquiry, on the 13th of August last. Four districts out of 44 sent no returns, but adding a proportionate number for them, it appears that the number usually kept in the metropolitan districts amounted to 18,000, and very probably from out-lying parishes sending milk up by cart and not by railway, there may be several thousands more. I may, therefore, probably assume that London has been hitherto supplied by 24,000 cows, besides what it has got by railway.

I have to thank the managers of the several metropolitan railways for the material of the following table, from which I see that the Great Western Railway has sent very little up till latterly; that the North-Western has sent up 40,000, 60,000, and 100,000 gallons annually during the last three years; that the Great Northern has sent up 250,000 and 300,000 gallons in 1863-4; that the Great Eastern has sent up 600,000, 800,000, 900,000, and 1,000,000 gallons respectively in the last four years; that the South-Eastern has sent up 120,000 to 180,000 gallons; the Brighton about 50,000 gallons, and the South-Western about 400,000 gallons annually. Upwards of 2,000,000 gallons were thus brought up last year, and this must be added to the 24,000,000 gallons with which, exaggerating perhaps a little, we shall credit our 24,000 cows. We cannot, at any rate, make out more than 26,000,000 of gallons for the 3,000,000 of London population last year. This is rather more than 8 gallons a-head per annum; rather less than one-fifth part of a pint of milk a day apiece.

GALLONS OF MILK ANNUALLY IMPORTED BY METROPOLITAN RAILWAYS.

	1861.	1862.	1863.	1864.
Great Western	Very little until 1865.			
North-Western (at 16 galls. to the can)	43,217	64,560	65,280	85,616
Great Northern	..	..	258,870	209,396
Midland	None	..	..	..
Great Eastern	606,400	884,523	940,702	1,020,492
South-Eastern	114,567	122,483	134,669	186,092
Brighton and South Coast	312	9,038	18,406	54,004
London, Chatham, and Dover	No return.			
South-Western	About 1,500 gallons a day =			400,000

GALLONS OF MILK IMPORTED MONTHLY IN 1865.

	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	October.
Great Western ..	?	?	?	?	?	?	?	23,474	59,782	103,214
North-Western (16 galls. per can)	14,168	13,024	12,752	10,242	6,624	6,656	8,480	23,152	76,160	123,952
Great Northern ..	14,904	15,276	16,416	18,216	20,124	20,392	20,556	20,952	21,924	26,016
Great Eastern ..	76,818	76,846	74,783	84,452	69,891	68,212	82,525	70,005	101,212	112,890
South-Eastern ..	15,804	15,245	17,547	19,414	23,843	22,638	20,680	22,559	17,307	21,318
South-Western ..	3,760 gallons a day during the last three months.									
London, Bright- ton, and South Coast	At the rate of 84,000 gallons a year.									

The returns given in another table (next page), for which I have to thank the vestry clerks and inspectors of the several parishes within the metropolitan districts, show the way in which the number of licenses for town cow-houses is being reduced from year to year. The present number of cows has been told me in a very few instances only; but Mr. Jones, of the East of London Cowkeepers' Association, announces that of 4456 cows usually kept in his district, only 805 are now remaining. And though this is much beyond the average of other districts (for instance,

in Chelsea there were 745 cows usually kept, 182 have been sold fat during the autumn, and not above 10 or a dozen have been killed by the plague, and 45 fresh cows have been brought in) yet I gather from an inspection of the returns, still imperfect, to the Privy Council office, that there is no reason to doubt that one-half of the London cows have disappeared, and we are probably now dependent on 10,000 instead of 24,000 cows in and around London.

Under these circumstances of course the railways have

PARISH OR DISTRICT.	No. of Cowsheds.			No. of cows usually kept.	No. of cows kept now.
	1863.	1864.	1865.		
Fulham	...	...	65	550	530
Kensington	49	38	33	750	300
Paddington	...	...	...	273	200
Marylebone	69	70	56	1,314	292
Chelsea	...	...	30	745	560
St. George, Hanover-square	...	...	14	395	?
Westminster	...	...	21	431	?
St. James's	...	...	0	0	0
Strand	...	...	4	92	20
Holborn	21	19	18	398	43
Hampstead	...	...	22	483	?
St. Pancras	100	99	92	1,178	266
Islington	...	71	69	1,317	108
St. Martin's-in-the-Fields	...	...	0	0	0
City of London	...	...	17	248	156
St. Luke's	...	...	?	...	...
Clerkenwell	...	33	29	650	160
St. Giles and St. George	...	...	9	170	nearly empty
Shoreditch	51	49	50	629	395
Hackney	...	83	83	1,288	450
Bethnal-green	...	0	40	463	277
Limehouse	...	...	23	188	71
Whitechapel	...	37	34	522	?
Mile-end Old-town	34	38	29	560	?
St. George's East	16	18	18	200	53
Poplar Union, North District }	...	...	11	206	?
Bow	...	...	...	...	...
Poplar, All Saints	45	48	47	290	230
Wandsworth	...	...	26	112	?
Putney and Roehampton	...	...	9	80	?
Clapham	...	...	25	...	?
Lambeth	...	...	104	980	?
Camberwell	...	...	59	555	?
Streatham, Tooting, and Balham	...	...	19	121	?
St. John and St. Olave	...	3	2	38	9
St. George the Martyr, Southwark	...	...	...	...	?
Bermondsey	...	...	24	300	119
Lewisham	17	19	12	?	?
Lee and Kidbrooke	...	...	10	235	?
Eltham	...	...	21	309	?
Newington, S.	...	...	34	452	?
Charlton	...	...	?	?	?
Plumstead	...	...	42	168	?
Greenwich	57	51	46	700	?
Rotherhithe	...	...	4	25	?

been brought into more active use, and they certainly now must lay themselves out more systematically than hitherto for the conveyance of milk. Special trains, will, perhaps, be appointed, and special carriages constructed to enable its prompter and more safe conveyance. The table shows that the Great Western Railway, formerly carrying little milk, brought in 23,000, 39,000, and 103,000 gallons in August, September, and October (much of it from Wiltshire); the London and North-Western Railway in four successive autumn months imported 6,000, 17,000, 57,000 and 92,000 gallons; the Great Eastern rose from 70,000 to 100,000, and at length 112,000 gallons monthly, the South-Western rose from 1,500 gallons to 3,760 gallons a day, and other railways in some what similar proportion, so that London was supplied in October last with country milk at the rate of 5,000,000 gallons annually, which, however, was still a very inadequate return for the milk of 14,000 cows, which we have lost.

THE CONSUMPTION OF MILK.

I shall now state, as shortly as possible, such facts as I have gathered on the consumption of milk. Fourteen schools and asylums for children, containing 5,321 between two and sixteen, with about 500 adults to take care of them, consume, as I have been kindly informed by the managers of them, as nearly as possible 1,650 quarts a-day. Two adult asylums, not infirmaries, nor gaols, nor workhouses, containing 2,350 adults, men and women of all ages, consume only 350 quarts. I believe a company of 5,320 children, up to 16 years of age, need about 9,000 adults of all ages to be added to them, in order to make a community of all ages in the proportionate number which such ages represent in every general population. Adding, therefore, to the consump-

tion of these that of 9,000 adults, according to the quantity of the two instances already specified, and you have a total of about 2,400 quarts drunk daily by 11,320 people, which is as nearly as possible (42 pint), 2-5ths of a pint a-day a-piece consumed by a large general population under medical direction. It is plain, then, that London, which under the very liberal estimate already made does not get one half of this quantity a-head, is very imperfectly fed with milk.

DAILY CONSUMPTION OF MILK IN INSTITUTIONS.

INSTITUTIONS.	Average age of children.	Children.	Adults.	Daily milk.
Asylums:—	Years.	No.	No.	quarts.
1.....	2 to 18	1150	60	173
2.....	11½	471	?	128
3.....	3 to 12	420	100	240
4.....	4 to 15	545	70	280
5.....	3 to 14	300	30	188
6.....	7 to 14	330	?	106
7.....	2 to 14	210	?	56
8.....	9 to 14	291	31	40
9.....	7 to 16	147	?	48
10.....	?	160	15	74
11.....	7 to 15	120	?	45
Schools:—				
12.....	11 to 15	757	?	94
13.....	?	170	15	55
14.....	14	250	?	127
Adult Institutions:—				(skim)
15.....	...	...	2250	300
16.....	...	...	300	50
		5321	2871	2004
Add adults (estimated) in attendance on } asylums and not specified above			229	
			3100	

What do other places get? Stirling, in Scotland, has a population of 12,500 persons, and is supplied by 190 cows in the town, besides 200 gallons a-day of buttermilk (a most nutritive and useful food) brought in by rail and otherwise. We have here a cow to every 60 people; and this, at the average of 800 gallons yearly to every cow in milk (less than I have put the produce of a London cow, because there is not so frequent a change among them) gives 100 imperial pints per annum to every man, woman, and child, or about 2-7ths of a pint a-day a-piece, very nearly the medical standard, and indeed exceeding it when the 200 gallons a-day of buttermilk are taken into account, for this would furnish half a pint a-day to the 3,200 belonging to the labouring class in a community of 12,000. I have to thank Mr. David Morton, of Stirling, for the above facts.

Take now Mansfield, in Nottinghamshire. There are here about 10,000 people, and 108 cows, one to every 93 people, just midway between Stirling and London. Taking these at 800 gallons a head per annum, and adding 20 gallons of skim milk daily, of which I hear as being sold in the outskirts of the town, we have only nine gallons (72 pints a head) per annum, or 1-5th of a pint a day a-piece—one half the medical standard.

And this result corresponds to the ascertained consumption of seven working men and their families in Mansfield. These included 31 souls, and their consumption per week cost altogether 4s., just 1d. a day to each family, for which they would get 1-10th of a gallon. Five gallons a week for 31 people, or 40 pints for 217 days of one person, is less than one-fifth of a pint a day. I have to thank Mr. Henry Wilson, of Sherwood, for these facts.

Take, now, Bedford. It contains at present about 15,000 people, and there are exactly 100 cows in the town, and 123 gallons of milk, the produce of about 50 other cows are brought in daily by railway. One hundred and fifty cows to 15,000 people are one cow to 100 people, about the same as at Mansfield; and this, at 800 gallons a cow, is about 70 pints a year, or one-fifth of a pint a year a-piece—one-half the medical standard. I have to thank Messrs. Howard, of Bedford, for the above statistics.

All these instances exceed the London standard of supply, though the two last are not so much beyond the metropolitan supply. It is plain, however, from these figures, that London is imperfectly supplied, and that I have still to justify the belief I have expressed that it is as well fed as many south country villages. Single instances will hardly prove this, or I could say that in my own village there are labourers' families with many small children who hardly ever taste milk after they are weaned. And I have seen the year's accounts of an Essex labourer who received the prize of £5 offered for many years by Mr. Wood, of Rochford, for the best year's cash book, kept by an agricultural labourer. His family with five children spent 6s. 2d. on milk in 1863, representing probably 150 pints of skim milk—or three-sevenths of a pint—not of whole milk for one, but of skim milk for seven daily. But the thing cannot be proved by individual cases. Let us, therefore, take the result of Dr. Edward Smith's inquiry for Government into the diet of the poorer classes of the country. He found that the weekly consumption of milk in the families of agricultural labourers (and he examined into from 10 to 30 cases in each county chosen with a special view to fairness) was 12 pints in Devonshire, $2\frac{1}{2}$ pints in Somerset, 3 in Dorset, $3\frac{1}{4}$ in Wilts, 3 or 4 pints in Bucks, Herts, Cambridgeshire, 1-3d of a pint in Surrey, 1-5th of a pint (9 families examined) in Gloucestershire. Of course I am choosing the lowest examples on his list, but they are all examples of whole counties. Now, these numbers have to be divided by 5 (the average number of the family), and by 7, the days of the week, before you can ascertain the quantity consumed by each individual daily.

I find that in a poor court in the Strand there are 57 families, 294 souls living in 13 houses, and their daily consumption of milk is less than 4s. in all, for which they get 9 quarts or thereabouts. This is $\frac{1}{16}$ th part of a pint a piece, and there was among them a baby brought up by hand, which had one pint a day to its own share, which still further reduced the general proportion. The milk for the baby, I may add, cost $2\frac{1}{2}$ d. in the shop, or 3d. if had direct from the cow. This is very little indeed, but there was an unusual number of adults in the company, only 40 children out of 294; and I will engage to find within two miles of my house at Streatley households numbering 294 in all, with double this number of children among them, who don't spend 4s. a day on milk nor anything like it, and who have not the chance of buying milk even at 3d. a pint from the cow if they wished it.

Looking at the quantity consumed by agricultural labourers in some of the southern counties, in Gloucestershire, for example, which may be called a land flowing with milk, I think I am right in saying that London, badly off as it is, is yet as well supplied as many south-country villages. Of course, however, it will not do to compare the quantity consumed in London with that which is used in Westmoreland, Northumberland and Scotland. Dr. Smith returns them there at 24 to 30 pints per family each week, or nearly a pint a day apiece.

In Berwickshire and many lowland counties it is almost universal for the farm labourers with families to keep cows and drink the whole of their skim-milk themselves; and where will you find better proof than in the labouring population of Scotland and the North of England, of the truth of words which I venture to quote from a letter of Mr. Chadwick to myself:—

"I can state as my general conclusion, from all my observation and information in respect to populations, that a cheap and abundant supply of fresh and good milk is of more importance for their health and strength than an abundant supply of meat. The foundation of the adult is laid in childhood and youth. Now our strongest and best labourers are from milk and oatmeal fed, or milk and bread, and milk and potatoe-fed children, as also from milk and oatmeal men with little or no meat. The strongest navvies are from the hill districts of

Lancashire, our strongest labourers from Cumberland and Westmorland, and from the hill districts of Scotland, Aberdeenshire in particular. These have been the favourite recruiting grounds for guardsmen and soldiers of the greatest size and strength."

I add here that I am told the Northumberland militia regiment, recruited from the milk-fed agricultural population of that county, covers, or used to, more ground than any other county regiment in the service.

But I must not forget that my subject is London milk. If the facts I have collected shall do nothing more than clear away prejudice and exaggeration from the minds of its consumers, the labour of gathering them will not have been useless; but I hope that they may have some influence on the trade; that the public attention being directed to the enormous increase in the railway carriage of it, some improvement in the facility and safety of that traffic may be effected; and, above all, that attention being directed to the very deficient supply of milk to London, some increased spur to enterprise in milk production may ensue.

One word more: On Tuesday of last week I had been all day over Clerkenwell, Bethnal Green, and Mile-end Old Town, along with the inspector, through some 10 or 12 cowhouses, and it was almost dark when we reached the last upon our list. I there saw what I had not seen all day before, a full cowhouse—70 or 80 first-rate Shorthorn cows, well and comfortably housed, lighted up with gas, and being fed and cleaned up for the night—the master busy working with his men. I said to him—"You seem all alive here. I have not seen a full cowhouse to day before; have you had no plague here?" He told me that he had had 40 stricken and killed by it; but the other 40 had been in the pastures, and so were saved. I said, "But there are more than 40 here. You have shown great pluck in bringing your 40 home and buying others." He said—"We grubbed up the floor, double lime-washed walls and mangers, and spread 2 inches of hot lime over everything, and waited a couple of months; and I believe, therefore, we are safe." "They tell me I am mad," he added; "but it is a madness I take great delight in, and as long as I have money to buy a cow and a place to tie her up in, I'll have her." "Well," I said, "at all events you are making a pretty penny now with mangels cheap and grains for the asking, and milk at 5d. a quart." He gave me, I suppose, banter for my banter, for we all know that pure milk is to be bought wholesale for 3½d. to 4d. a quart, and retail in most places for 1d. more. "5d. a quart," he said, "I won't sell fresh milk to you or any other man for less than 6d.; but you can get a quart of *something* in the shop there for 3d. if you like." Now if any gentleman here is disposed to cry "name!" I must refuse to give the name, for I have not aimed at personality at all in the course of this statement, and have only named one or two where especial credit was due; but if the inspector who was with me then be present now, he will remember the conversation, and also the laugh which followed his own assent to the nature of this "something." "Yes," he said, "blue ruin."—I tell this story, for it represents a very large portion of my case. London milk, as in this instance, so *generally*, comes from the very best cows in the world, both for milk and flesh—from the best fed cows in the world, taking all the year round—and taking the average experience, for the most part from the most comfortably housed cows in the world—comparing them with 24,000 anywhere else, and all the year round. I will also say that it comes from the hands of some of the most hearty and energetic men in the world, for the London cowkeepers, especially, of course, those in large business, want neither energy nor intelligence. And seeing that country milk, whether better or not in fields, is not so good at the railway terminus, I add that London milk is originally the best milk in the world for Londoners; but it is very generally *spoiled* between the milk-pail and the tea-cup—so that when it

reaches the consumer, it is often little better than what Mr. Inspector called it—a mere *ruin*.

DISCUSSION.

Mr. WENTWORTH L. SCOTT said this was a subject to which he had paid great attention in and out of the laboratory, and although he agreed generally with Mr. Morton's arguments he differed from some of the deductions therefrom. The results of the analyses published in Mr. Morton's tables hardly supported the views given in his paper. He granted that there were, in many instances, very beautiful cowhouses in London, and good arrangements for the production of milk, and they had in the London market the means of procuring the finest animals; but, as the result of his experience during eight or nine years, he believed really good dairy accommodation was the exception and not the rule over the broad area of London. There was one drawback, as he regarded it, which could not be got over—that was the impure air. They might give the animals good food, but they could not get rid of the extreme amount of ammonia, sulphurous acid, bi-sulphide of carbon, and other impurities of the atmosphere which had a tendency to produce diseases in all kinds of cattle. From the way in which the food of the animals was stored, in the majority of cases, it was liable to absorb all these noxious gases before it was served out to them. For the purpose of comparison, he had prepared a series of analyses which represented the milk production of four counties in England, showing what he considered a really good class of milk to be.

Cow's MILK (STANDARD).

	1	2	3	4	5
Water	85·75	86·75	88·10	84·81	84·50
Mineral matter	·78	·79	·67	·74	·77
Butter	3·62	3·65	2·99	3·86	4·31
Lactine	5·05	4·62	4·44	5·12	5·67
Caseine	4·80	4·29	3·80	5·47	4·75
Total	100·00	100·00	100·00	100·00	100·00
Solid matter	14·25	13·25	11·90	15·19	15·50
	6	7	8	9	10
Water	89·02	85·40	85·04	87·05	86·12
Mineral matter	·69	·75	·77	·72	·75
Butter	2·85	3·85	3·66	3·11	3·87
Lactine	4·18	4·90	5·08	5·19	4·72
Caseine	3·26	5·10	5·55	3·93	4·52
Total	100·00	100·00	100·00	100·00	100·00
Solid matter	10·98	14·60	14·96	12·95	13·88

Dr. WHITMORE remarked that when they considered the great importance of milk as an article of food, more especially to the juvenile portion of the population, and when they also remembered that the animals which produced this important article of food were now subjected to a very devastating disease, they could not overestimate the importance of the paper with which Mr. Morton had favoured them. In the discharge of his duties as medical officer of the large district of Marylebone, he had felt it his duty to inquire closely into the quality of the milk supplied to the inhabitants of that district. There was no doubt that the "cow with the iron tail" was largely in requisition in the production of London milk, which was very much diluted. Still, although this was so, he had not, upon the whole, found that London milk was inferior to country milk as regarded its nutritive constituents; but he was induced, as the result of his investigations, to come to an opposite conclusion. As a rule London milk contained a larger proportion of cream, more caseine, or cheesy matter, and more sugar than country milk. In order that he might be quite correct in his results he had recently conducted a large number

of experiments on milk from cows which he knew to have been fed in the country, as well as from some fed in town, and he found that although for the most part the food they ate was of the same description, yet the London milk contained from two to three per cent. more cream than that from the country, and a great deal more caseine. The preceding speaker inferred that the food of London cows underwent a certain amount of decomposition by deleterious gases. He (Dr. Whitmore) thought that was a mistake. The best quality of hay and root food was supplied to them; and though in some cases distillers' wash and sour grains were given, that was the exception, not the rule. Another important article supplied to cows was water. In the country, where cows were kept out of doors, their supply of water was obtained from ditches or streams, the water of which contained a considerable amount of organic matter, while, as a rule, the London cows drank the water supplied by the water companies, which was much purer. With regard to the effect of London cow-sheds on the health of the population, he agreed with Mr. Morton to this extent—that when they were in really open situations they were not injurious; but when they were placed—as they often were—in confined localities without full opportunity for free ventilation—and generally these were the most dirty—he had reason to know that the health of the inhabitants did suffer. He was satisfied if they were obliged to go 100 miles away for milk, they would have it, as stated in the paper, unfit for use. The shaking during the journey produced a breaking up of the oil globules, and injured the milk. His experience led him to pronounce in favour of open, well ventilated sheds, in the neighbourhood of London, for the supply of milk to the metropolis.

Dr. VOELCKER said there was one remark which fell from Mr. Morton which he could thoroughly endorse, viz., that London milk, when undiluted, was better than country milk, and especially richer in butter. He ascribed this to the fact that London cowkeepers for the most part fed their animals with better food—especially rich in fatty matters. He was, however, bound to say that London milk as generally sold to the consumer was not what it ought to be, but on an average was mixed with about 30 per cent of water (there was no other adulteration); and that a portion of the cream was taken off, was an equally undoubted fact. He could not take so favourable a view of London milk as Dr. Whitmore. That gentleman's own statement, he thought, proved what he (Dr. Voelcker) asserted—that there was generally a large amount of dilution. Where there was this considerable admixture of water, the specific gravity of the milk was invariably low. He maintained that milk which had a specific gravity below 1·026 was not genuine. He had carried out a great number of experiments purposely with the object of finding out an easy test of the general qualities of milk without having recourse to actual analysis, and he had come to the conclusion that the specific gravity test, in addition to ascertaining the quantity of cream that would rise, was an excellent method of ascertaining in a rough way what the quality of milk really was. He invariably found the richer the milk was in cream, the higher was its specific gravity. Some of his analyses, not embodied in Mr. Morton's paper, showed this. He therefore strongly recommended the managers of large public institutions, such as workhouses, lunatic asylums, &c., to apply the simple test of specific gravity. It was true skim-milk had a high specific gravity, but the mixture of water with it was apparent from the sky-blue tinge. When milk showed a specific gravity of 1·028 to 1·030 it might be relied upon as being genuine. He was anxious to make this statement as founded on a great number of his own analyses, and because the opposite opinion had been circulated in Dr. Whitmore's report—that the specific gravity test could not be relied on in respect to the genuine character of milk.

Dr. WHITMORE observed that in the *Lancet* commis-

sioners' report, milk was considered to be genuine which had a specific gravity of 1.021 to 1.022.

Mr. WEBBER remarked that there was one feature of the case which had not as yet been presented to the notice of the meeting. Since the outbreak of the cattle disease a clamour had been raised for more milk from the country; but it was to be recollected that to the extent to which milk was taken away from a county like Wiltshire, so much cheese was proportionately lost. The milk was never wasted. In the Aylesbury district the milk was turned into the best quality of butter; and of course if it were sent to London this could not be produced. He saw no reason why, under a proper licensing system for cow-houses, an adequate supply of this important article should not be obtained from London itself and its environs. He regretted that the investigation of this subject had shown the existence of so much demoralization in the milk trade generally; at the same time, even in the form in which they got it, it was a very useful article of food, and it was highly desirable to increase its quantity, but he thought this should be done by other means than depriving the country districts unduly of a commodity which was reproduced in other valuable forms of food.

Dr. DRUITT expressed his gratification at hearing a subject of this practical nature treated in the dispassionate, able, and truthful manner in which it was treated by Mr. Morton. As the medical officer of St. George's, Hanover-square, he had frequently gone into the subject of the adulteration of milk, and had as often given it up in despair of accomplishing any good. His analyses had been very numerous, and were practised on specimens bought in small quantities at retail shops. It was impossible, with a specific gravity as low as 1.017, to expect to find much cream in the milk. He agreed with the last speaker that the specific gravity test was perhaps the simplest, the readiest, and the cheapest, to which he also thought should be added the quantity of cream the milk afforded. Then there was a third test—that of the sense of taste and smell, which would go a great way in detecting the presence of water in milk, as well as in wine and beer. It was important that a good supply of pure milk should be provided, more especially when we remembered the large number of infants who were dependent on that article for their sole food. The returns of the Registrar-General exhibited a fearful table of infant mortality, and the various causes of death assigned might be summed up as simply meaning starvation. This resulted, to a great extent, from the milk with which they were fed having been deprived of its nutritive elements, only the thick curd remaining, which the delicate stomach of a child could not digest, and which occasioned diarrhoea, atrophy, and the multitudinous diseases which told so terribly upon the infant portion of the population. Dr. Druitt expressed himself as favourable to the feeding of cows in close proximity to London, and submitted that by no persons could that business be better conducted than by those who had been all their lives engaged in it, and the price of milk having been considerably enhanced, the public had a right to demand that they should be supplied with an honest and good article.

The CHAIRMAN having suggested that it would be desirable to hear the views of London cowkeepers on the subject,

Mr. DREWELL said he could entirely corroborate the statements with regard to the superior quality of London milk over that supplied from the country. He had cows in London, and also at a distance of five miles from the metropolis, and he could state that the milk he had from the longer distance was not so good in quality as that which was produced in London. The cows were fed in the same manner in both cases. The cause of this difference he could not explain, unless it arose from the injury to the milk in the transit. A great deal of the milk from long distances arrived in London in a very bad state, particularly in hot weather.

The CHAIRMAN inquired whether Mr. Drewell found any difference in the healthiness of the animals in town and country.

Mr. DREWELL replied that he found no difference in that respect. He had been as unfortunate with his stock in the country as in London.

Mr. DANCOCKS could vouch for all that had been said with respect to London and country milk. He had been a dairyman for 30 years, and his experience had long led him to the conclusion that London milk was far superior to that from the country. The great thing to be feared was that the recent ravages of the cattle disease would lead to a great decrease in the supply of London milk, from keepers being disinclined to maintain their usual stock of cows, owing to the very serious losses which most of them had sustained. The only security which could be afforded was the establishment by the Government of a National Cattle Insurance, so that the sheds might be filled again with cows, and the supply of milk to London be restored. He had been very unfortunate with his own stock. The animals which Mr. Morton mentioned as having been inspected by him were all gone, and great inroads had been made by the disease upon the fresh stock he had bought. He was not surprised at the complaints which were made against the quality of the milk, looking at the price at which it was supplied. The cost of the cows was about 12s. per head per week, and the average yield of each was from nine to ten quarts per day. He considered, including all the expenses, milk cost the producer in London 3d. per quart, and threefarthings per quart must be added for retailing it; yet it was expected that the article should be sold to the consumer at 4d. per quart. He contended the price ought to be fivepence or sixpence per quart to give a fair remuneration to the produce. He was extremely glad to see such a meeting on this subject, and he felt personally obliged to Mr. Morton for the very able manner in which he had dealt with it.

Mr. CAMPBELL (of Rugby) said they had heard a great deal this evening about the difference between London and country milk, and all the speakers hitherto had expressed an opinion that country milk was decidedly inferior to that produced in London; but they had no facts or figures in support of that proposition. One speaker had said he was at a loss to account for the difference between the milk given five or six miles from London and that produced in London, unless it arose from the shaking of the milk in its carriage to town. It occurred to him that if cows were properly fed and attended to in the country, there was no practical reason why there should be any difference between London and country milk, except that it might perhaps arise from the want of proper mechanical arrangements for the transit. It was possible there was something in the present mode of transmission which affected the quality of the milk when it reached London. He thought some mechanical arrangements could be invented for carriage, which would enable the country to supply milk of good quality to the metropolis. He could corroborate generally the statement of Mr. Morton as to the consumption of milk in towns. At Rugby, with a population of under 9,000, the number of cows kept was equal to something like one cow to every 70 of the population—very similar to what was the case in London. The fact was the people of the south did not think so much of milk as the people of the north. In Scotland it was regarded as a positive necessary of life, whereas in the south people thought more of beer than of milk.

Mr. G. M. ALLENDER rose to support the superiority of country milk over that of London. He believed, moreover, that the test of specific gravity was entirely fallacious, inasmuch as weight could be obtained by spurious means. One reason why the London dealers preferred London-grown milk to that brought from the country probably was that in the transit by railway the milk was so much shaken and churned, that they

could not afterwards skim it, and thus deprive it of its cream. Within the last few weeks he had carried out some experiments very carefully, under his personal observation, with the milk of one cow. By feeding the animal with the customary food used in Aylesbury she produced three and a-half gallons of milk per day; that was, running at grass with no other food than good hay. On putting the same animal upon London food—grains, Swedes, and cake—it was true that the yield of milk was increased from $3\frac{1}{2}$ gallons to 5 gallons per day, but there was not one ounce more butter in the latter quantity than in the former, and the $3\frac{1}{2}$ gallons yielded an equal quantity of nutritive constituents to the 5 gallons. That cow produced at the present price of milk 8s. 4d. per day, and he was keeping it for 11s. 6d. per week, which left him about £2 profit, an amount which he thought a dairyman ought to be satisfied with. He thought London would be better supplied with milk from the country than from within itself, but the great difficulty at present was the transit of the article by railway; and when he stated the fact that from Aylesbury and an adjacent station, as much as 2,000 gallons of milk per day were sent, at a cost of about £3,000 per annum, and than ten such stations would yield a return of £30,000 a year to the railway company, he thought it would be to the interest of the company to supply proper appliances to convey the milk to London in an uninjured condition. For that purpose he suggested the employment of trucks with double roofs like the carriages in India and Egypt, so that the current of air passing through the double roof would keep the milk in a cool state, while a simple mechanical contrivance would prevent that shaking which so materially deteriorated the milk. He further suggested that the loads of milk sent up at night should remain in the trucks all night (especially in hot weather) in a siding four or five miles from London, and that they should be brought up to town specially at an early hour in the morning. By these means the quality of the milk would be best preserved. In his opinion the future supply to London would depend entirely upon the railways. They had heard the case of one enterprising cowkeeper who lost the whole of his stock and a great part of a second stock, and unless there was a cessation of the disease he felt pretty certain that cowkeeping in London would cease altogether, and their only supply would be from the country.

Mr. JONES stated that as an amateur dairyman he had on some occasions a great deal of milk thrown on his hands through being spoilt in keeping, and this led him to adopt the plan of cooling the milk down by placing it in pans of water. Looking at the question in an agricultural point of view, it was true they could not get more bulk of produce off the soil than the average qualities of land would yield, but it was possible, by the use of materials from foreign countries—such as grain and oil-cake—to increase the produce of milk. This was done to a great extent by farmers in his own neighbourhood, and thus the materials from America and other countries went to increase the produce of the soil of England, and he thought that system was carried out as much in the country as it was in London. With regard to the alleged better quality of London milk, he would be glad to be informed in what sense the term "better" was taken? Did the superiority consist in the quality of the article or in the time it would keep good? because in the mind of the London dealer the milk which would keep the longest was best for his purposes, and he did not trouble himself either about the proportions of caseine or other constituents, or its specific gravity. If the country milk were treated in the same way as the London the probability was it would arrive in better condition; but if milk was put into the cans warm, and closed over so that the steam could not escape, the condensed vapour dropping into the milk would have a prejudicial effect in promoting decomposition.

Mr. LUNDY (of Edinburgh) suggested a mechanical

contrivance for the carriage of milk by railway, similar to that adopted for suspending the mariner's compass. In addition to the double-roofed truck, the cans might be placed in rows along the middle of the carriage, suspended on universal joints; and, if that were done so as to prevent the violent agitation of the milk, he believed the country milk would reach London in a condition that would leave no cause of complaint, and would be better than a good deal of the London milk at the present time. As a member of the Sanitary Committee of the Town Council of Edinburgh, he expressed himself very strongly against the system of feeding the milch stock of that locality on the coarse rank grass produced on the Craighentenny meadows by sewage irrigation. Yet it was the fact that those meadows were let to cowkeepers at the enormous rent of £40 per acre. One question which occurred to his mind was whether the physical condition of our milch stock had not been impaired by taking away the calves from their parent and bringing them up upon the "blue ruin," instead of allowing their frames to be developed by the rich aliment of the genuine milk. To remedy this, it might be a question whether it would not be desirable to import into the country foreign stock from the River Plate, and other parts of South America where they existed in herds in the wild state, and in undeteriorated physical condition.

The CHAIRMAN said the time had now arrived when it became his agreeable duty to propose a vote of cordial thanks to Mr. Morton for the exceedingly interesting and valuable paper he had read. If time had permitted he should have been glad to have entered a little into the discussion of this subject, but there was one point to which he would refer. The subject treated of in the paper was the supply of London with milk, and Mr. Morton had not taken up the sanitary considerations pertaining to the question; but in such a large population as existed in London he thought the sanitary question was one that ought not to be overlooked. He was sure he only expressed the feeling of the meeting when he said they tendered to Mr. Morton their best thanks for the exceedingly able, clear, and interesting paper which he had read.

The vote of thanks having been passed by acclamation,

Mr. MORTON said he was much obliged for the compliment paid him. He would merely confirm the statement made by Mr. Lundy, that that rank grass produced by the Edinburgh sewage brought the enormous rent of £40 per acre for the production of milk. He thought this was a sufficient answer to the objections urged by that gentleman against feeding cows on that description of pasture.

Manufactures.

NEW SUGAR MACHINE.—The *Bulletin Commercial* gives the following particulars of a vacuum machine, invented by MM. Cail et Cie, which has been used with success in Mauritius by M. Portal, owner of the Anse Jonchée estate. The apparatus consists of three vertical cylinders of copper, each containing two tubes half the internal height of the cylinders in which the steam circulates. The cylinders are six feet high and three feet in diameter, and are surrounded by a wood casing, which materially retards the loss of heat; they communicate with the outside by pipes. The first cylinder receives the waste steam which had hitherto been entirely lost, from the defecators and other machines used in the factory. The steam which rises from the boiling liquid in the first, warms the liquid contained in the second cylinder, and the steam from the second in its turn warms the third; a successive diminution of atmospheric pressure in each cylinder takes place, and this reduction allows an active ebullition to go on notwithstanding the diminution in heat. Two men suffice to look after the appa-

ratus, and if the vacuum-pan be conveniently placed, those who are occupied with it can also attend to the cylindrical generators. By this arrangement all the men employed in looking after the coppers, and the furnace which warms them, are rendered unnecessary, and the sugar is prepared at a temperature which renders the formation of molasses impossible. The quantity of crystallizable sugar given by the juice, thus becomes considerably greater, and at the same time its quality is said to be so superior that it hardly requires to be washed in the centrifugal machine. The simplicity of the apparatus is such that M. Portal finds that an ordinarily intelligent Indian can take charge of it after a few hours' training, and the only thing required for success is great cleanliness. It works with such rapidity that the cane-juice crystallizes in two to two and a half hours. The saving of fuel by this system is said to amount to one-third.

Commerce.

BEETROOT SUGAR.—Messrs. Arnold Baruchson and Co., of Douai and Liverpool, in their *Beetroot Circular*, express their belief that the present low price of beet, as compared with cane sugar, which they regard as an anomalous position of the trade, cannot last after the close of this year, because 70,000 tons of beet sugar having been purchased for Great Britain (supposing that the estimate of the crop, instead of 200,000 tons, be raised to 220,000 tons, and they feel inclined to believe that the yield will reach that figure), there would remain 150,000 tons, or only 4,000 tons more than last year's crop. Although a general monetary crisis and a sugar panic was raging at this period last year, still 21 to 32 francs was paid in November and December, 1864, for No 12., the present quotations being only 28 francs to 28 francs 50 cents. Whilst clayed Manilla and other low brown sugars are selling from 24s. to 25s. in England, and No. 12½ Mauritius was recently sold for an outport at 28s., strong grainy beet, in every respect equal, if not stronger and superior to Mauritius, can be laid down in England at 26s., whilst ordinary sorts may now be shipped at 23s. 6d. to 24s., f.o.b., according to quality and delivery; consequently, either cane sugar must decline in price, or an advance must take place in beet. The disproportion in value has already led many refiners in Great Britain, who hitherto have resisted its introduction into their houses, to purchase beet, and it is predicted that those refiners who still object to it will have to adopt its use or find themselves unable to compete. Those who are prejudiced against the use of beet argue, however, that the syrup is so much inferior as to reduce the value of the sugar—such was the case when only low brown syrups were imported into England. The sugars now shipped, from 12 to 14, besides containing a less quantity of molasses, are much purer, and free from objectionable flavour. The constant improvements in the process of manufacture are also in favour of the produce of beet. The quality of the present crop in France and Belgium, and also in Germany, continues to be very satisfactory. The probable total production for the year, from the more perfect information now possessed, is computed at 560,000 tons.

Colonies.

SUGAR IN QUEENSLAND.—The land now in cane crop embraces about 90 acres at Cleveland, and 70 acres at the Pumpama and Holkam rivers. The area of land to be put under cane crop this season will be regulated by the quantity of plants available for the purpose. Practical men who have inspected the crop at Cleveland predict a large and profitable return. The Colonial Treasurer was about to introduce a Bill to legalise the

distillation of rum upon sugar-growing estates, which it is expected will secure the planters against possibility of loss upon the first year's crop.

CITY OF MELBOURNE.—On 29th August last it was 30 years since the City of Melbourne was founded. On the 29th August, 1835, Mr. J. P. Faulkner, with five others, sailed up the Yarra in the *Enterprise* and landed on the site of the present city. According to a return, published recently by the Registrar-General, the estimated population of the colony of Victoria on the 30th June, was 616,663, viz., 354,229 males, and 262,434 females, showing an increase during the quarter of 3,206 males, and 2,564 females.

Publications Issued.

A HANDY BOOK OF SANITARY LAW. By Martin Ware, jun., Esq., Barrister-at-law. (*Bell and Daldy*.) This work is published under the authority of the Society of Arts, and has been prepared for them by Mr. Ware, in consequence of a recommendation to that effect from the Society's Committee on the Dwellings for the Labouring Classes. In their report they remarked as follows:—"Whatever progress may be made in building or adapting houses by individuals or societies, the great mass of the labouring population, for many years to come, must necessarily live in very crowded neighbourhoods, in houses now existing, and not originally adapted to contain several families under one roof. It is therefore of the first importance that the owner of existing houses, inhabited by the poor, should be obliged to provide those sanitary appliances which are required for the preservation of the health of the tenants, and to check, when it occurs, the progress of infectious disease. Long experience has shown that nothing but constant inspection and compulsory measures will meet the carelessness and cupidity of the owners of this kind of property. The present sanitary laws are comprehensive, and, on the whole, efficient, although there are some particulars in which the Committee think they require amendment, especially with relation to the inspection of houses let to lodgers, but not now subject to the provisions of the Common Lodging Houses Act. The provisions of the Sanitary Acts are not, however, sufficiently known, nor do those who are qualified by intelligence and position to attend to the sanitary condition of their own neighbourhood interest themselves as much as could be desired in seeing that the powers of the law are put in execution." The Committee, therefore, recommended that the Council should prepare and publish a concise analysis of the existing law, hoping thereby to call the attention of the educated classes to this important subject, and to point out how they may, merely by a little attention and exertion, confer most important benefits upon a large mass of working people, and upon the country generally. The author expresses himself indebted for the assistance which Mr. Benjamin Shaw, an active member of the Committee, has given him in the preparation of the work. The matter is contained in forty-eight pages; and the book is sold for 6d.

Notes.

CAPTAIN FOWKE'S FUNERAL took place on Dec. 9, at Brompton Cemetery. Besides his family and relations there were present the following officers of the Royal Engineers—Major General Sandham and Major-General Matson, Col. Sir J. William Gordon, K.C.B., Col. Chapman, C.B., Col. Simmons, C.B., Col. Leach, Col. Hawkins, Col. Scott, Col. Harness, C.B., Col. the Hon. H. F. Keane, Col. Charles Gordon, C.B., Col. Collinson, and Col. Jervois, C.B.; Majors Ewart and Leahey; Capts. Martindale, Marsh, Sibourne, Charles Chesney, Du Cane, Decie, Andrew Clarke, Donnelly, and Festing;

Lieuts. R. O. Jones and Crawford. Also Messrs. H. Cole, C.B., Redgrave, R.A., S. Redgrave, Seymour Haden, Graham, J. C. Robinson, Rev. De La Merc, Sir W. Dilke M.P., Mr. Moffatt, M.P., Mr. Owen Jones, Mr. Digby Wyatt, Sir F. Sandford, M'Leod of M'Leod, Messrs. G. Godwin, Stephenson, Joseph Taylor, George Forrest, Thomas Lucas, P. C. Owen, A. S. Cole, G. C. T. Bartley, Snell, Liddell, C. Rowe Dillon, G. Redgrave, G. F. Duncombe, Sandham, Simkins, Townroe, Gamble, Eldon, and Douglas. Mr. Lowe, M.P., Mr. Godfrey Sykes, and many others were prevented from attending. The carriages of Lord Granville, Mr. T. Lucas, and other friends followed.

CARRIAGE OF NEWSPAPERS.—The London and North-Western Railway Company advertise that on and after 1st January, 1866, stamped newspaper labels, in sheets of 60, to cover the conveyance of newspapers, may be obtained at the company's offices in London, Birmingham, Liverpool, Manchester, Lancaster, Chester, and Shrewsbury. These stamps will be issued to frank the carriage of newspapers between any stations on this railway at the rate of one halfpenny for each single copy. This arrangement is not to interfere with the present rates for the conveyance of newspaper trade parcels.

SOUTHAMPTON SCHOOL OF ART.—The distribution of the local medals and other rewards, given by the Government Department of Art, to students of this school and of the schools in connection with it, recently took place at a public meeting held in the Hartley Hall, over which the Mayor (Mr. S. M. Emanuel) presided, Manockjee Cursetjee, Esq., judge of Bombay, distributing the prizes. The Mayor, in opening the meeting, introduced Mr. Manockjee Cursetjee as a gentleman who, casting aside the bigotry and superstition prevalent in his country a few years since, had come here and associated himself with us in order to study and the better to understand our national characteristics, and—what was still more—who had caused his two daughters to be educated in a manner before unknown to the people of their country. Mr. Manockjee Cursetjee said this was the first occasion on which a native of the far east had been invited to address a meeting and to distribute prizes to a school of art. He trusted, however, that this would not be the last occasion of the kind, but that similar honour would be paid to those who might hereafter travel in this country. He dwelt upon the advance made in art, especially decorative art, in the last thirty years. This he attributed to various causes, but especially to its recognition by Government and the establishment of schools of art. He spoke especially of the school at Southampton, and expressed his gratification at its success. A vote of thanks to Mr. Cursetjee, proposed by Dr. Joseph Bullar, and seconded by Mr. Fulney, was carried unanimously.

MEETINGS FOR THE ENSUING WEEK.

- MON.** ...British Architects, 8.
Actuaries, 7. Mr. Marcus N. Adler, "Memoir of the late Benjamin Gompertz, F.R.S., with some account of his contributions to Actuarial Science."
Medical, 8. Mr. James Lane, "A Clinical Account of the Patients Treated by Inoculation by Dr. Roock at the Lock Hospital."
Asiatic, 3.
TUES. ...Civil Engineers, 8. Annual General Meeting.
Statistical, 8. Dr. Farr, "The Mortality of Children in the different States of Europe."
Pathological, 8.
Anthropological, 8.
WED. ...Society of Arts, 8. Mr. Owen Rowland, "On Parkesine: its Composition, Manufacture, and Uses."
Geological, 8.
London Inst., 7.
R. Society of Literature, 8½.
THURS. ...Royal, 8½.
Antiquaries, 8½.
Linnaan, 8. 1. Sir John Lubbock, "On the Metamorphoses of (*Chlocoen*) Ephemeræ." 2. Mr. Butler, "On Amber."
Chemical, 8. Mr. J. Yates, "On the Material for Mural Standards of Length."
Philosophical Club, 6.

Patents.

From Commissioners of Patents Journal, December 8th.

GRANTS OF PROVISIONAL PROTECTION.

Animal substances, preserving—3009—T. Redwood.
Boots and shoes, lacing—3019—G. Moreton.
Boxes—3006—J. H. Johnsen.
Carding engines, pointing the cards on—2876—R. Swires.
Casks—3061—G. Marshall.
Cork-cutting machines—3033—J. H. Johnson.
Embossing—3063—J. E. Brown.
Fabrics for dyeing, stretching and rolling—3059—H. A. Dufrené.
Fabrics, knitted—2718—T. Webb.
Fire, extinguishing—2854—J. C. Edington.
Fret-cutting machines—2896—W. Middleton.
Furnaces—3025—W. A. Lytle.
Gun carriages—2976—T. B. Heathorn and J. H. G. Wells.
Hair dressing, &c., brushes for—2985—G. Smith and C. Ritchie.
Heat, raising—3029—J. F. Bennett.
High temperatures, registering—2780—F. H. Gossage.
Letter press and lithography, adapting cylinder printing machines to—2999—T. W. Nicholson.
Malt liquor, unfermented—3047—C. H. Newman.
Meat, preserving—2892—T. Redwood.
Nautical safety apparatus—3045—F. Mols.
Ordnance, mounting—3021—R. Mallet.
Oxygen—2934—J. T. A. Mallet.
Paper—3067—C. S. Baker.
Perishable substances, preserving—3043—W. R. Lake.
Photography, obtaining printing surfaces by—3053—A. V. Newton.
Pottery—3015—G. W. Turner.
Printed proofs, photography applied to obtain—2954—E. & J. Bullock.
Railway signals—2907—S. Hand and J. Slater.
Ships' barrels—3039—J. Manifold.
Springs, helical or spiral—3023—W. E. Newton.
Stays and bodices—3011—J. Ellis.
Steel castings—2970—G. Taylor and J. Fernie.
Steering indicators—2864—C. J. Viehoff and J. A. Matthiessen.
Submarine electric cables, laying of—2948—J. de la Haye.
Tea and coffee pots, handles of—3055—J. Thompson.
Thrashing machine—2888—T. Berrens.
Vessels, hulls and tackle of—3031—J. Ferrier.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Hair, machinery for weaving—3066—G. T. Bousfield.
Shirt collars—3065—G. K. Snow.
Wells, sinking—3074—J. H. Johnson.

PATENTS SEALED.

1564. H. Hunt and R. Hunter.	1820. W. A. Lytle.
1582. R. A. Brooman.	1892. T. Swinburne.
1588. G. Bonelli.	1956. W. E. Newton.
1590. R. A. Brooman.	2000. J. Pickin and R. Bailey.
1593. W. J. Hixon.	2112. W. Clark.
1602. T. Routledge and W. H. Richardson.	2302. W. Cory and J. H. Adams.
1628. M. Henry.	2426. J. Davidson.
1708. W. E. Newton.	2494. I. Smith and W. F. Batho.
1790. A. V. Newton.	2516. J. W. M. Miller.
1818. G. T. Livesey.	2648. J. de W. Brinckerhoff.

From Commissioners of Patents Journal, December 12th.

PATENTS SEALED.

1596. J. A. Millington and A. Allnutt.	1642. V. Baker.
1598. J. J. Bodmer.	1648. W. Clay.
1600. C. J. Collins.	1657. J. Parrish, C. Thatcher, and T. Glascock.
1601. J. H. Johnson.	1673. N. de Becker.
1607. B. and S. Massey.	1703. C. Worsam and G. Evans.
1608. C. de Vendeuvre.	1737. W. Schofield.
1613. S. Courtauld and C. W. Atkinson.	1749. J. Atkins.
1614. H. Ormson.	1760. M. Benson.
1624. P. Lawrence and G. Jefferys.	1811. G. B. Woodruff.
1625. J. Hartley.	1913. W. E. Newton.
1627. W. E. Gedge.	1948. R. Mortimer.
1629. R. A. Brooman.	2023. J. A. Leon, G. Tessimond, and J. Kissack.
1630. R. A. Brooman.	2033. G. B. Woodruff.
1632. C. A. la Mont.	2092. W. E. Newton.
1633. W. T. Wanklyn.	2437. J. Donnell.
1636. A. Klein.	2509. J. A. Mee.
1638. G. Payne.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

3316. J. King.	3279. R. E. Donovan.
3260. T. G. Webb.	3281. W. Palliser.
3262. L. Christoph, W. Hawksworth, & G. P. Harding.	3354. J. Varley and J. Crowther.
3287. G. A. Huddart.	3282. G. Lowry.
3300. G. Jeffries.	3313. D. Chalmers.
3348. G. Buchanan.	3392. S. C. Lister.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2808. J. Ferrabee & F. H. England.	2815. A. Lamb & W. A. Summers.
2838. W. Beardmore.	2848. W. E. Wiley.
2794. R. A. Brooman.	2884. J. H. Selwyn.